A New Bird in the Alaskan Arctic:
Lessons learned during coordination of manned and unmanned aerial operations in 2013 and 2014

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Abstract

Airspace over the northeastern Chukchi and western Beaufort seas is one of three locations in the Arctic where the Federal Aviation Administration (FAA) plans to establish permanent operational areas and corridor routes (to access coastal launch sites) for operating small UAS (sUAS) for research and commercial purposes. This action would enable over-water flights from the surface to at least 2,000 ft AGL. The airspace in this Alaskan Arctic area has been used for decades by manned aircraft transporting passengers and cargo, conducting scientific research, military missions, search and rescue operations, and other activities. The level of sUAS activity in the Alaskan Arctic has increased in recent years and is expected to continue to increase in the future; however, this increased UAS traffic precedes the development and standardization of UAS technology to detect and avoid other aircraft. While the FAA is working to develop rules, standards, and regulations specific to UAS operations, the arctic airspace user community is proactively working to develop protocols to create an environment where a variety of aerial operations can occur safely, efficiently, and successfully. In 2013 and 2014, the airspace users worked together and with the FAA to deconflict the Alaskan Arctic airspace. We report on the lessons learned during the coordination of aerial operations in 2013 and 2014. Some of the achievements made during those years were: 1) creation of an Arctic Aerial Survey Coordination Group (AASCG), that included representatives from manned and unmanned aerial projects; 2) daily simultaneous operations ("SIMOPs") phone calls to allow the AASCG to communicate directly with field teams; 3) distribution of detailed flight plans throughout the AASCG; and 4) evaluation and revision of communication protocols once projects commenced. Recommendations for improving coordination among manned and unmanned aircraft projects in the Alaskan Arctic in the future include designating a central authority to coordinate all flights in the sUAS airspace, developing a grid-based system that can be referenced when communicating flight plans, and requiring that all airspace operators distribute detailed information about their proposed projects to airspace users well in advance of project start dates.

Background information

The FAA Modernization and Reform Act of 2012 required the FAA to:

Initiate a process to work with relevant Federal agencies and national and international communities to designate permanent areas in the Arctic where small unmanned aircraft may operate 24 hours per day for research and commercial purposes and Search and Rescue (SAR) operations. The plan for operations in these permanent areas shall include the development of processes to facilitate the safe operation of unmanned aircraft beyond line of sight (BLOS). Such areas shall enable over-water flights from the surface to at least 2,000 feet in altitude, with ingress and egress routes from selected coastal launch sites. (https://www.faa.gov/uas/legislative_programs/arctic/)

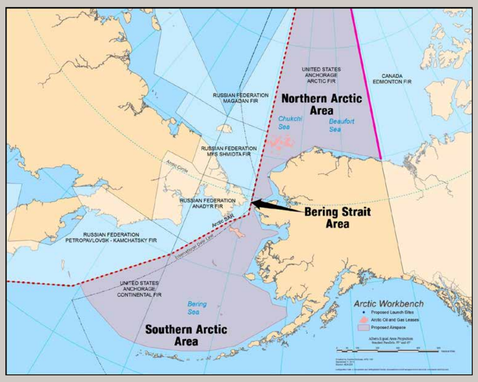
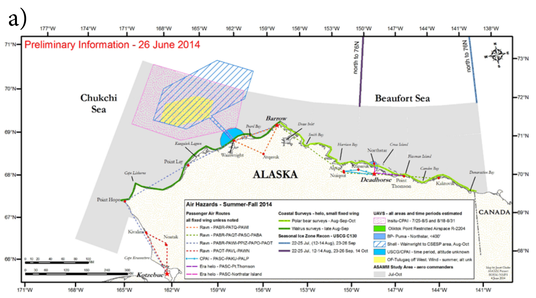


Figure 1. The FAA plans to establish three permanent Arctic areas to comply with the Act: 1) Southern Arctic Area; 2) Bering Strait Area; 3) Northern Arctic Area.

We focus on the Northern Arctic Area, which includes airspace that has been used for decades by aerial surveys and other general aviation traffic for transporting people and things.

a)



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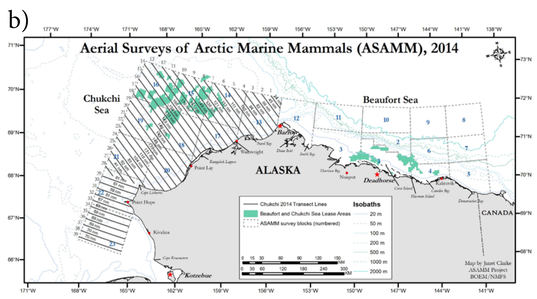


Figure 2. a) Examples of potential airspace users in the Northern Arctic Area during summer and fall of 2014. b) ASAMM study area showing survey blocks, 2014 Chukchi Sea transect lines, and current lease areas. Transect lines in the Beaufort Sea are generated daily and, therefore, not shown.

Concerns

- How to deconflict the airspace among all of the manned aircraft and sUAS?
- sUAS have limited detect and avoid capabilities
- FAA relies on theoretical analyses of the probability of collision
- Expected increase in the number of sUAS operations in the Arctic in the near future
- Larger areas of sUAS operation require more coordination and communication among airspace users because they are more difficult to avoid
- FAA regulations must be followed; however, they are not necessarily sufficient for promoting an environment where multiple airspace users can safely and successfully operate. If gaps exist between FAA regulations and what is necessary for safe and successful operations, airspace users should implement additional risk mitigation measures.

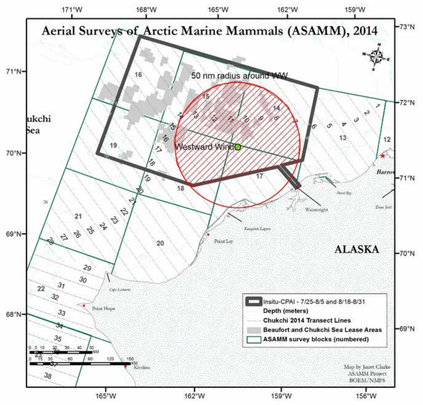


Figure 3. Example of detailed sUAS flight plan, shown as a radius around the research vessel used for launch and recovery. The sUAS flight plan is shown relative to the ASAMM study area.

Achievements in 2013 and 2014

- During summer and fall of each year, 2013 and 2014, 3 UAS operations and 1 broad-scale aerial survey project safely and successfully shared the Northern Arctic Airspace
- The deconfliction processes included senior staff with authority in their fields who were knowledgeable about the manned and unmanned aerial projects and aviation
- Arctic Aerial Survey Coordination Group
  - Established in 2014
  - Enables information to be shared among airspace users, including commercial manned aircraft pilots, sUAS pilots, research groups (private, governmental, and academic), and FAA
- Daily simultaneous operations ("SIMOPs") calls
  - Enables airspace users to communicate directly to ask questions or solve problems
    - Pertinent details about sUAS and manned aircraft operations changed over the course of the field seasons. The SIMOPs calls provided a way to efficiently address issues in order to revise protocols, as necessary.
- Distribution of detailed flight plans (map or radius around ship) using a widely available communication systems like telephone and email
  - How many sUAS will be flying?
  - Where will sUAS be flying relative to others in the AASCG?
    - Due to existing limitations in sUAS ability to detect and avoid, the Aerial Surveys of Arctic Marine Mammals (ASAMM) project chose to avoid the sUAS operation areas each day sUAS were flying
- Redundant communication systems
  - Test communication systems in the field
  - VHF radio, marine band radio, satellite phones, and email can all go down, sometimes simultaneously.
    - ASAMM decided it was not acceptable to fly if the sUAS or manned aircraft pilots could not communicate flight plans, changes to flight plans, or emergency situations with other airspace users.

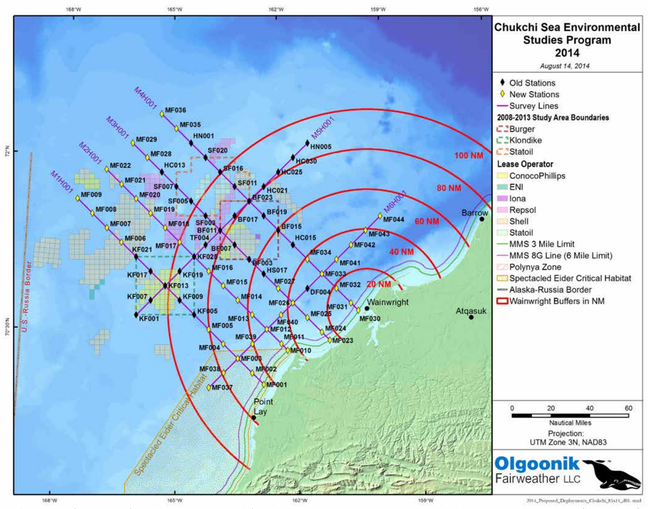
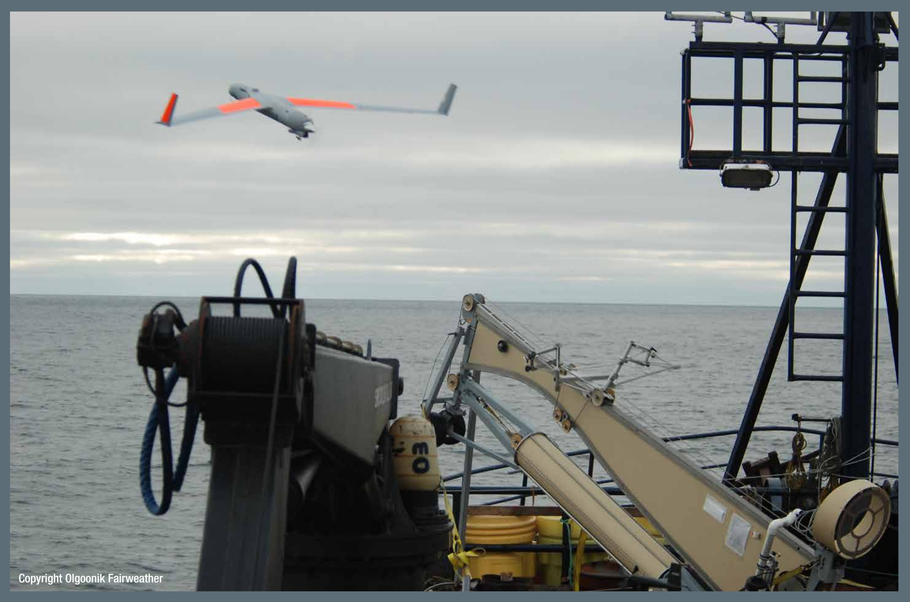


Figure 4. Chukchi Sea Environmental Studies Program operations in 2014. Radial distances ("buffers") from the sUAS launch and recovery site at Wainwright are shown in red.

Recommendations for improvement

- Organize and authorize a centralized coordination system, like the system used to coordinate airplanes flying through hurricanes
- Implement a grid system to help communicate the location of daily flight plans
- Ensure that all airspace users, manned and unmanned, participate in the AASCG and SIMOPs calls.
- Provide detailed information about sUAS projects at least 7 days prior to the start of operations, including:
  - Location of study area (coordinates or GIS file)
  - Date of operations
  - Maximum number of sUAS authorized to operate simultaneously
  - Typical time and duration of flights
  - Flight altitudes
  - Point contact for questions arising prior to or during field operations
  - In-field communication information:
    - VHF and marine band radio frequencies
    - Phone numbers
    - Email addresses
    - Websites
  - Study overview or concept of operations
  - Instructions for viewing the real-time location of the sUAS (if possible)
  - Communications protocol

GOAL
Safe, efficient, and successful operations for all airspace users



Acknowledgments

We thank the representatives from the following entities for participating in the daily SIMOPs calls: Olgoonik Fairweather, ACUASI, ConocoPhillips, Shell, Insitu, R/V Westward Wind, Federal Aviation Administration, US Fish and Wildlife Service, Bureau of Ocean Energy Management (BOEM), and NOAA UAS Program Office. In addition, the Aerial Surveys of Arctic Marine Mammals project thanks BOEM for funding (IAA M11PG00033) and their efforts to ensure that the surveys are conducted safely. Phil Hall and Brad Fritzler (NOAA Office of Marine and Aviation Operations) provided invaluable assistance in coordinating the airspace users in 2013 and 2014. We are very grateful to Rebecca White (Alaska Fisheries Science Center, NOAA Fisheries) for designing this poster.